forest management note

Note No. 44 **Northern Forestry Centre** **Edmonton, Alberta**

CONTAINER SEEDLING FIELD PERFORMANCE AFTER 10 YEARS

Growth of white spruce (*Picea glauca* (Moench) Voss), lodgepole pine (*Pinus contorta* Dougl. var. *latifolia* Engelm.), and jack pine (*Pinus banksiana* Lamb.) container seedlings in Alberta and Saskatchewan after 5 years is directly related to the size of the seedlings when outplanted (Walker and Ball 1981). Container volume and the length of greenhouse rearing time have a determining effect on original seedling size. From the Walker and Ball study (1981), growth trends after 5 years are still apparent 10 years after outplanting. Plantations used for 5-year comparisons could not always be used during the 10th year due to browsing by snowshoe hares or big game animals, and other plantations have been substituted for the growth comparisons.

Survival of spruce and pine, based on more than 34 000 container seedlings planted at several sites (Fig. 1) between 1971 and 1974, averaged 81%, ranged from 65% to 95%, and was generally superior for stock grown in larger containers (Table 1). White spruce seedlings reared in 164-cm³ containers for 14 weeks in the greenhouse and planted in the Edson Forest District were 51% taller than seedlings reared 4–12 weeks in 40-cm³ containers and planted in the same district (Table 2). When 164-cm³ container seedlings at Edson were compared with 40-cm³ container seedlings reared for 10–15 weeks and planted at Whitecourt and Grande Prairie, however, they averaged only 98% of the height of the seedlings from the smaller containers. Height to 10 years in the latter two forest districts is indicative of more favorable site and climatic conditions for growth of white spruce.

Lodgepole pine reared in 164-cm³ containers for 14 weeks and planted in the Edson Forest District were 52% taller than seedlings reared in 40-cm³ containers for 4–12 weeks and planted in the same district and 16% taller than seedlings reared in 40-cm³ containers for 10–15 weeks and planted in the Bow River-Crowsnest and Grande Prairie forests.

Figure 1. Location of container seedling plantations established between 1971 and 1974.

Jack pine reared in 492-cm³ containers for 18 weeks (over a 2-year period) and planted at Meadow Lake and Candle Lake, Saskatchewan, were 17% taller after 5 years, and only 5% taller after 10 years, than seedlings reared in 40-cm³ containers for 10–13 weeks and planted at Candle Lake. Severe hare browsing before the 10th-year remeasurement killed 40% of the trees

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Table 1. Percentage survival of container seedlings after 10 years

Species	Container size and type	Years after planting 1	3	5	10	Basis
Lodgepole pine	40-cm³ Spencer-Lemaire	88	79	75	66	2 093
	40-cm³Styroblock and ARC Sausage	94	88	85	78	7 999
	164-cm³ Spencer-Lemaire	95	90	86	76	4 245
White spruce	40-cm³ Spencer-Lemaire	88	79	75	65	1 077
	40-cm³ Styroblock and ARC Sausage	94	86	81	73	4 658
	164-cm³ Spencer-Lemaire	95	90	88	80	3 975
Jack pine	40-cm³ Styroblock	98	97	97	84	364
	492-cm³ Spencer-Lemaire	—[a]	—	97	95	10 368
Average		—	—	88	81	

[a] No data available.

Table 2. The effects of container size and rearing time[a] on seedling height 5 and 10 years after planting at several sites

	White spruce			Lodgepole pine			Jack pine	
	Edson		Grande Prairie, Whitecourt, Bow River - Crowsnest	Edson		Grande Prairie, Whitecourt, Bow River - Crowsnest	Candle Lake	Meadow and Candle Lakes
	A	C	B	A	C	B	B	D
5-year average height (cm)	25	46	35	34	70	55	111	138
10-year average height (cm)	73	110	112	135	206	177	288	303
Number measured	648	3 165	2 974	1 312	3 242	5 923	364	9 850

[a] A: 40-cm³ Spencer-Lemaire containers. Greenhouse rearing time: 4–12 weeks.
B: 40-cm³ BC/CFS Styroblock and ARC Sausage containers. Greenhouse rearing time: 10–15 weeks.
C: 164-cm³ Spencer-Lemaire containers. Greenhouse rearing time: 14 weeks.
D: 492-cm³ Spencer-Lemaire containers. Greenhouse rearing time: 18 weeks.

Figure 2. Nine-year-old jack pine browsed by hares.

outplanted from the 40-cm³ containers (Fig. 2). Because the smallest trees were more readily browsed and killed, the height of the survivors reflects a greater mean plantation height for the smaller container system, causing a bias in favor of the 40-cm³ stock.

Assessment to 10 years shows the following results:

1. When seedlings are outplanted in the same forest district with similar growing conditions, substantial height growth and survival benefits are derived by planting larger stock; this can be produced by using larger containers and longer greenhouse rearing periods.

2. Planting either larger stock grown in larger containers or bare-root seedlings will result in better height growth and will reduce the length of time that the seedlings are susceptible to hare damage during the plantation establishment period.

3. Basal sweep and long-term stability problems have been observed 5 to 10 years after planting with pine container seedlings (also see Burdett et al. 1986), and these are directly related to the length of the rearing period. Caution should therefore be exercised when considering a longer rearing period for pine containers.

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